

SYSTEMS AND APPLICATIONS OF LIGHTER-THAN-AIR (LTA) PLATFORMS

RELATED APPLICATIONS

[0001] This Application is a Continuation-In-Part of U.S. patent application Ser. No. 14/473,691, filed Aug. 29, 2014 (now allowed), which is a Divisional of U.S. patent application Ser. No. 13/757,585, filed Feb. 1, 2013 (now U.S. Pat. No. 8,825,232, issued Sep. 2, 2014), which is a Divisional of U.S. patent application Ser. No. 12/099,004, filed Apr. 7, 2008 (now abandoned), which is a Divisional of U.S. patent application Ser. No. 10/673,474, filed Sep. 30, 2003 (now U.S. Pat. No. 7,356,390, issued Apr. 8, 2008), which is a Continuation-In-Part of U.S. patent application Ser. No. 10/129,666, filed May 9, 2002 (now U.S. Pat. No. 7,203,491, issued Apr. 10, 2007), filed as National Stage of PCT/US02/12228 filed Apr. 18, 2002, which claims benefit to U.S. Provisional Application No. 60/284,799 filed Apr. 18, 2001; the contents of all of which are incorporated herein in their entirety by reference.

TECHNICAL FIELD OF THE INVENTION

[0002] The present invention relates to unmanned lighter-than-air platforms operating in the stratosphere and more particularly, their termination and recovery.

BACKGROUND OF THE INVENTION

[0003] Unmanned lighter-than-air ballooncraft have been used for many years to perform tasks such as near space research, and meteorological measurements. Such ballooncraft have even carried payloads with instrumentation that sometimes includes radio transmission capabilities.

SUMMARY OF THE INVENTION

[0004] Innovative new methods in connection with lighter-than-air free floating platforms, of facilitating legal transmitter operation, platform flight termination when appropriate, environmentally acceptable landing and recovery of these devices are provided. Especially, termination of radio transmissions and flight related to regional, governmental and international border requirements, regulations and laws. The present invention provides methods comprising specific criteria, detection of the criteria and elements of operation for reducing or preventing illegal transmissions, for producing rapid descend to the ground, for environmentally acceptable landing and for facilitating recovery all with improved safety and enhanced compliance with known regulations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] A better understanding of the invention may be had with reference to the attached drawing Figures in connection with the Detailed Description below in which like numerals represent like elements and in which:

[0006] FIG. 1 schematically depicts a flow diagram of combined methods of a termination decision by a processor including termination criteria, criteria detection by sensing of geographic position and velocity and elements of operation according to certain aspects of the invention;

[0007] FIGS. 2 schematically depict a mechanism for providing and for releasing ballast according to certain aspects of the present invention;

[0008] FIG. 3 is a schematic partial front view of a neck of a platform connecting between a balloon and a payload and depicting the construction and method of releasing a balloon from the payload platform;

[0009] FIG. 4 is a schematic partial front view of the neck of a platform connecting between a balloon and a payload as in FIG. 3 further depicting the release of the balloon from the payload platform;

[0010] FIG. 5 is a schematic diagram for a battery discharge and neck release circuit;

[0011] FIGS. 6, 7 and 8 are front side and end views, respectively, of a “maple seed” descent mechanism attached to the bottom of a platform according to one embodiment of certain aspects of the invention; and

[0012] FIG. 9 is a schematic depiction of a landed terminated platform (without balloon) transmitting a locator signal to a floating platform transceiver that relays the locator information to a ground station to facilitate recovery of the terminated platform.

DETAILED DESCRIPTION OF THE INVENTION

[0013] It has been found that the previous largest use of unmanned lighter-than-air ballooncraft has been by the various weather services of the world. For weather data acquisition purposes small latex weather balloons carry instrument packages called radiosondes to gather the weather data. These weather balloons are launched from a network of sites around the world at noon and midnight Greenwich Mean Time each day. The weather service radiosondes collect temperature, humidity, pressure and wind data as they rise from the surface of the Earth to approximately 100,000 feet during a two-hour flight comprising ascent and rapid descent. At approximately 100,000 feet the weather balloons burst and the radiosonde payload falls to earth on a parachute. This data acquire during the ascent is input into atmospheric models run on supercomputers to facilitate predicting the weather. The input data is limited as it represents only a snapshot of the weather data taken during the balloon ascent every 12 hours. The ascent and decent is rapid, mostly within country borders. Also, most countries of the world are bound by treaty to launch balloon carried radiosondes from designated sites and to share the data with other countries such that short duration radio transmissions and physically crossing borders is not any major issue.

[0014] Currently there are about 800,000 radiosondes launched each year throughout the world. There are also a small number of radiosondes launched for military and research purposes. The research balloons typically are done using special frequencies and with international or individual country permission for border crossing. The total number primarily represents the 997 global weather stations launching two radiosondes per day, 365 days per year (727,000). Only about 18% of these radiosondes are recovered, reconditioned and reclaimed, resulting in the new production of about 650,000 weather-gathering radiosondes per year.

[0015] The Federal Communications Commission (FCC) prohibits uncontrolled transmitters as they may cause interference to users on the same frequency or others on nearby frequencies. FCC spectrum licenses prohibit a US licensed transmitter from transmitting when it leaves the border of the US.